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Redactie: Dr. J.-P. Borie (Compiègne, France), Dr. L. De Bruyn (Antwerpen), T. C. Garrevoet (Antwerpen), B. Goater (Chandlers Ford, England), Dr. K. Maes (Tervuren), Dr. K. Martens (Brussel), H. van Oorschot (Amsterdam), W. O. De Prins (Leefdaal).

Redactie-adres: W. O. De Prins, Leefdaal 401B, B-3061 Leefdaal (Belgium).

e-mail: willy.de.prins@telenet.be.

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New data on the Rhopalocera (Lepidoptera) of Dobrogea (south-eastern Romania)

Vlad Dincă, Sylvain Cuvelier, Levente Székely & Roger Vila

Abstract. We provide new data on the Rhopalocera of Dobrogea (south-eastern Romania), a region that represents a meeting point for faunistical elements from Central Europe, Balkans, Asia Minor and the Russian steppe. *Lycaena tityrus* (Poda, 1761) and *Neptis sappho* (Pallas, 1771) are rediscovered in Dobrogea after 142 years and are recorded for the first time in the south of the province. New faunistical data as well as ecological and conservation aspects are also provided for several species with very few records in Dobrogea, such as *Zerynthia polyxena* ([Denis & Schiffmüller], 1775), *Brenthis daphne* (Bergsträsser, 1780), *Brenthis ino* (Rottemburg, 1775), *Brenthis hecate* ([Denis & Schiffmüller], 1775), *Euphydryas maturna* (Linnaeus, 1758), *Hipparchia syriaca* (Staudinger, 1871), etc. The survival of *Tomares nogelii* (Herrich-Schäffer, 1851) in Romania is discussed as directed research didn't allow for the discovery of any population both in previously known or potential sites. The presence of *Carcharodus floccifera* (Zeller, 1847) in Dobrogea is confirmed by genitalia and new data is presented that indicates its probable sympatry with *Carcharodus orientalis* Reverdin, 1913 in this province. In addition, *C. orientalis* is recorded in Romania for the first time outside Dobrogea, namely from neighbouring south-eastern Moldavia.

Samenvatting. We brengen nieuwe gegevens over de Rhopalocera van Dobrogea (Zuidoost-Roemenië), een regio die een ontmoetingspunt is van faunistische elementen van centraal Europa, de Balkan, Klein-Azië en de Russische steppe. *Lycaena tityrus* (Poda, 1761) en *Neptis sappho* (Pallas, 1771) worden voor het eerst na 142 jaar terug gemeld uit Dobrogea en voor het eerst uit het zuiden van de provincie. Er worden nieuwe faunistische gegevens alsook aspecten over ecologie en natuurbehoud verstrekt voor meerdere soorten met zeer weinig meldingen uit Dobrogea, zoals *Zerynthia polyxena* ([Denis & Schiffmüller], 1775), *Brenthis daphne* (Bergsträsser, 1780), *Brenthis ino* (Rottemburg, 1775), *Brenthis hecate* ([Denis & Schiffmüller], 1775), *Euphydryas maturna* (Linnaeus, 1758), *Hipparchia syriaca* (Staudinger, 1871), enz. Het voortbestaan van *Tomares nogelii* (Herrich-Schäffer, 1851) in Roemenië wordt besproken daar gericht onderzoek niet heeft toegelaten om een populatie te vinden en dit zowel op vroeger gekende als op potentiële plaatsen. De aanwezigheid van *Carcharodus floccifera* (Zeller, 1847) in Dobrogea wordt bevestigd door genitalia en nieuwe gegevens worden voorgesteld die wijzen op het waarschijnlijk sympatrisch voorkomen in deze provincie met

Carcharodus orientalis Reverdin, 1913. Daarnaast wordt *C. orientalis* uit Roemenië voor het eerst gemeld buiten Dobrodgea namelijk uit het aanpalende zuidoostelijke Moldavië.

Résumé. Nous apportons des nouvelles données concernant les Rhopalocera de la Dobrodgea (Sud-Est de la Roumanie), une région qui représente un point de réunion d'éléments faunistiques de l'Europe centrale, les Balkans, l'Asie Mineure et la steppe Russe. *Lycaena tityrus* (Poda, 1761) et *Neptis sappho* (Pallas, 1771) sont enregistrés pour la première fois depuis 142 ans de la Dobrodgea et pour la première fois du Sud de la province. Des nouvelles données faunistiques ainsi que des aspects écologiques et concernant la conservation de la nature, sont fournies pour plusieurs espèces avec très peu de données de la Dobrodgea comme *Zerynthia polyxena* ([Denis & Schiffermüller], 1775), *Brenthis daphne* (Bergsträsser, 1780), *Brenthis ino* (Rottemburg, 1775), *Brenthis hecate* ([Denis & Schiffermüller], 1775), *Euphydryas maturna* (Linnaeus, 1758), *Hipparchia syriaca* (Staudinger, 1871), etc. La survie de *Tomares nogelii* (Herrich-Schäffer, 1851) en Roumanie est discutée car des recherches ciblées n'ont pas permis de trouver une population aussi bien dans des sites qui étaient anciennement connus que dans des sites potentiels. La présence de *Carcharodus floccifera* (Zeller, 1847) de la Dobrodgea est confirmée par les genitalia et des nouvelles données indiquent la cohabitation probable dans cette province avec *Carcharodus orientalis* Reverdin, 1913. De plus *C. orientalis* est mentionné pour la première fois de la Roumanie hors de la Dobrodgea, à savoir du proche Sud-Est de la Moldavie.

Rezumat. Sunt prezentate noi date referitoare la fauna de Rhopalocera a Dobrogei (sud-estul României), o regiune care reprezintă un punct de întâlnire a numeroase elemente faunistice din Europa Centrală, Balcani, Asia Mică și stepele rusești. *Lycaena tityrus* (Poda, 1761) și *Neptis sappho* (Pallas, 1771) sunt redescoperite în Dobrogea după 142 de ani și sunt totodată semnalate pentru prima dată din sudul provinciei. Noi date faunistice precum și aspecte legate de ecologie și conservare sunt prezentate pentru mai multe specii cu foarte puține semnalări din Dobrogea, precum *Zerynthia polyxena* ([Denis & Schiffermüller], 1775), *Brenthis daphne* (Bergsträsser, 1780), *Brenthis ino* (Rottemburg, 1775), *Brenthis hecate* ([Denis & Schiffermüller], 1775), *Euphydryas maturna* (Linnaeus, 1758), *Hipparchia syriaca* (Staudinger, 1871), etc. Este discutată situația lui *Tomares nogelii* (Herrich-Schäffer, 1851) în România, întrucât cercetări direcționate nu au permis identificarea nici unei populații atât în zone deja cunoscute cât și potențiale. Prezența lui *Carcharodus floccifera* (Zeller, 1847) în Dobrogea este confirmată pe baza analizei împăturii genitale și sunt oferite noi date care indică că, în această provincie, specia este probabil sămătrăcă cu *Carcharodus orientalis* Reverdin, 1913. În plus, *C. orientalis* este semnalat în România pentru prima dată din afara Dobrogei, și anume din sud-estul Moldovei.

Key words: Romania – Rhopalocera – Dobrogea – distribution – habitat – conservation.

Dincă, V.: Departament de Genetica i Microbiologia, Universitat Autònoma de Barcelona, Bellaterra, 08193, Spain (sudistu@yahoo.com).

Cuvelier, S.: Diamantstraat 4, B-8900 Ieper, Belgium (sylvain.cuvelier@pandora.be).

Székely, L.: Str. Viitorului 31, Săcele (Brașov), 505600, Romania (levi.szekely@gmail.com)

Vila, R.: ICREA and Departament de Genetica i Microbiologia, Universitat Autònoma de Barcelona, Bellaterra, 08193, Spain (roger.vila@uab.cat).

Introduction

Dobrogea represents a historical region shared by Romania and Bulgaria, being bordered by the lower Danube River to the west and north, the Black Sea to the east and the southern border of the administrative Bulgarian regions of Dobrich and Silistra to the south (Fig. 1).

The Romanian part of Dobrogea includes the Danube Delta and covers a total area of about 15.500 km². It is divided in two counties: Tulcea in the north and Constanța in the south (Fig. 2). The altitudes in Dobrogea range from sea level in the Danube Delta and along the Black Sea coast, to 467 m in the Măcin Mountains, with most areas rising at 20–200 m above sea level. Although milder

than in most other parts of Romania, the climate is still temperate continental with an average temperature of about 10.6–11°C in the north and above 11°C in the south (Rákósy & Székely 1996, Rákósy & Wieser 2000, Székely 2006). Dobrogea is one of the driest regions of Romania, with average rainfall values of about 450 mm/year in the Măcin Mountains (Rákósy & Wieser 2000), 330–440 mm/year in the Danube Delta (Székely 2006) and 350–400 mm/year in southern Dobrogea (Rákósy & Székely 1996). Depending on the year, these values might sometimes substantially increase (up to 600 mm/year in the Măcin Mountains) (Rákósy & Wieser 2000) or decrease (less than 150 mm/year in parts of the Danube Delta and less than 200 mm/year in southern Dobrogea) (Rákósy & Székely 1996, Székely 2006).



Fig. 1.– General map of Romania and its historical regions, indicating the position of the Romanian and Bulgarian parts of Dobrogea. Black dots – Locations outside Dobrogea discussed in the paper. Letters refer to the localities in table 1.

The most notable geographic formations in Dobrogea are the Danube Delta and the Măcin Mountains, both lying in the northern part of the province (Fig. 2). While the Danube Delta represents the youngest Romanian territory (8.000–10.000 years old), the Măcin Mountains were formed during the Hercinic orogenesis (about 350 million years ago) and are some of the oldest mountains in Europe.



Fig. 2.— Map of the Romanian part of Dobrogea indicating the localities discussed in this paper. Numbers refer to the localities in table 1.

Belonging to the stepic eco-region, Dobrogea harbours a particular flora and fauna with many elements that are unique for Romania and even Europe. Rákossy & Wieser (2000) referred to Măcin Mountains as to a veritable bridge between Central Europe, the Balkans, Asia Minor and the Russian steppe. Given its geographic position and species composition, we would extend this affirmation to the entire Dobrogea. Of particular biogeographical interest are the Russian steppe elements or the pontic elements from Asia Minor that reach Dobrogea and in many cases do not infiltrate deeper into Western Europe.

As a consequence of its particular flora and fauna, several parts of Dobrogea are now declared nature reserves, including a national Park (Măcin Mountains)

and a biosphere reserve comprising the second largest delta in Europe (the Danube Delta).

Especially since the beginning of the last century, Dobrogea has been studied by many scientists who focused on various taxonomical groups, including the Lepidoptera. The first data on the Lepidoptera of Dobrogea come from Josef Mann (1866) who collected interesting material in the northern part of the province. Since then, many entomologists studied various parts of Dobrogea and their publications pointed out the uniqueness of the species assemblages occurring in many parts of this region. Among the most active lepidopterists in the region we mention: A. Ostrogovich, A. Caradja, A. Popescu-Gorj, I. Drăghia, E. Niculescu, F. König, M. Skolka, D. Ruști, M. Stănescu, C. Bere, M. Goia, Z. Kovács & S. Kovács, L. Rákossy, L. Székely, etc. As a result, many Lepidoptera were reported for the first time in Romania based on material collected in Dobrogea, among which several Rhopalocera such as *Carcharodus orientalis* Reverdin 1913, *Zerynthia (Allancastris) cerisyi ferdinandi* Stichel 1907, *Euchloe ausonia taurica* Röber, [1907], *Tomares nogelii dobrogensis* Caradja, 1895, *Pseudophilotes bavius egea* Herrich-Schäffer, 1852, *Melitaea punica telona* Fruhstorfer, 1908, *Hipparchia volgensis delattini* Kudrna, 1975.

Three recent major studies summarize most of the Lepidoptera data previously published about Dobrogea, while adding original data: Rákossy & Székely (1996), Rákossy & Wieser (2000) and Székely (2006).

Nevertheless, the fauna of Dobrogea is still not sufficiently studied from a lepidopterological point of view as fairly large areas were never visited by lepidopterists and many of the old records concerning a good number of taxa have never been confirmed. The records of Mann (1866) provide one of the best examples because many of them were never confirmed since then, including the following species: *Parnassius apollo* (Linnaeus, 1758), *Hamearis lucina* (Linnaeus, 1758), *Lycaena tityrus* (Poda, 1761), *Lycaena alciphron* (Rottemburg, 1775), *Lycaena hippothoe* (Linnaeus, 1761), *Cupido osiris* (Meigen, 1829), *Eumedonia eumedon* (Esper, 1780), *Aricia (Ultraaricia) anteros* (Freyer, 1838), *Cyaniris semiargus* (Rottemburg, 1775), *Polyommatus (Plebicula) dorylas* ([Denis & Schiffermüller], 1775), *Euphydryas aurinia* (Rottemburg, 1775), *Limenitis reducta* Staudinger, 1901, *Neptis sappho* (Pallas, 1771), *Pyronia tithonus* (Linnaeus, 1767), *Erebia aethiops* (Esper, 1777), *Erebia medusa* ([Denis & Schiffermüller], 1775), etc.

The aim of this study is to improve the knowledge on the Rhopalocera fauna of Dobrogea and neighbouring areas by adding original data on the distribution, ecology and conservation status for several taxa that are poorly known from these regions.

Table 1. Studied localities of Dobrogea and neighbouring areas (numbers correspond to the localities in figure 2; letters correspond to the localities in figure 1).

Symbol	Locality	Alt. (m)	County	Comments
1	2 km E of Smârdan	5	Tulcea	
2	Greci (Morsu Valley-Şaua Țuțuiatului)	150–220	Tulcea	W Măcin Mountains National Park
3	Nifon (Măcin Mts.)	130	Tulcea	E Măcin Mountains National Park
4	Cerna	80–120	Tulcea	SW Măcin Mountains National Park
5	3 Km E of Slava Rusă (Babadag forest)	130	Tulcea	Protected area of Babadag forest
6	10 Km S of Babadag (Babadag forest)	115	Tulcea	Protected area of Babadag forest
7	Gura Dobrogei	40-80	Constanța	Protected area
8	Canaraua Fetei (Băneasa)	20-90	Constanța	Protected area
9	Esechioi forest	130	Constanța	Protected area
Z	ca. 9 km E Zorleni	240	Vaslui	
O	Oancea	10	Galați	
G	Gârboavele forest	90	Galați	Protected area

Discussion

Zerynthia polyxena ([Denis & Schiffermüller], 1775)

Material. > 20 last instar larvae, Canaraua Fetei (Constanța county), 7.vi.2008.

The species was recently rediscovered in Dobrogea after 80 years and reported for the first time from the southern part of the province, where it is sympatric with *Zerynthia (Allancastris) cerisyi ferdinandi* Stichel, 1907 (Dincă & Vila 2008). The record was based on larvae found feeding on *Aristolochia clematidis*. In order to eliminate any possible confusion with larvae of *Z. cerisyi ferdinandi*, the identification was confirmed by DNA-based identification. Nevertheless, given the low number of larvae observed (five) and the uniqueness of the record, it was not possible to prove whether in Canaraua Fetei there is a more or less stable population or only an isolated case of ovoposition by a vagrant female (Dincă & Vila 2008).

On the 7th of June 2008, in Canaraua Fetei (Fig. 3), we found more than 20 last instar larvae of *Z. polyxena* feeding on *A. clematidis*. Some of the larvae were found on exactly the same group of *A. clematidis* as the ones recorded in 2007, while an even larger group was on a different but nearby patch of plants. All 12 collected larvae pupated successfully and are currently alive (adults should emerge in spring 2009). It is worth mentioning that, although *A. clematidis* is very well represented on different parcels in Canaraua Fetei, many other groups of *A. clematidis* were inspected without results. Thus, the larvae of *Z. polyxena* seem to be very localized and fairly difficult to find unless a thorough search is done.

With these new data, *Z. polyxena* can be considered a resident in Canaraua Fetei, flying at the same site as *Z. cerisyi*, but most likely about a month earlier. No larvae of *Z. cerisyi* were found on the same date, as this species flies between the second week of May and first days of June (Rákósy & Székely 1996).

***Euchloe ausonia* (Hübner, [1803])**

Material. 1 specimen, ca. 10 km S of Babadag locality (Babadag forest, Tulcea county), 5.vi.2008; 5 specimens, Gura Dobrogei (Constanța county), 5.vi.2008; 1 specimen, Esecchio forest (Constanța county), 7.vi.2008.

In July 1954 it was collected for the first time in the Romanian part of Dobrogea (one female) from Niculițel (northern Dobrogea) (Niculescu 1963), and a few years later from Canaraua Fetei (SW Dobrogea) (Popescu-Gorj 1959). The species is currently known in Romania only from Dobrogea:

Southern Dobrogea: Canaraua Fetei (Popescu-Gorj 1959, Rákósy & Székely 1996, Dincă & Vila 2008), Oltina, Comorova (Popescu-Gorj & Drăghia 1967), Hagieni (Popescu-Gorj & Drăghia 1964, Popescu-Gorj & Drăghia 1967, Skolka 1994, Bálint & Székely 1995, Rákósy & Székely 1996), Fântânița (Skolka 1994);

Northern Dobrogea: Niculițel (Niculescu 1963).

The specimen collected by us in Babadag forest represents the second record of this species in northern Dobrogea after 54 years. Moreover, we found the species to be fairly common in central Dobrogea (Gura Dobrogei), from where there are no previous records. Esecchio forest also represents a new locality for *E. ausonia* in southern Dobrogea.

It is worth mentioning that certain authors (Niculescu 1963, Popescu-Gorj & Drăghia 1964, Skolka 1994) cited the species from Tulcea (northern Dobrogea), based on the record of Mann (1866). Mann cited “*Antocharis Belia* Esp.” and it is unclear if he referred to *Anthocharis euphenoides* (Staudinger, 1869), a western Mediterranean species unlikely to be present in Dobrogea, or to *E. ausonia*. As a matter of fact, in older literature the complex *ausonia-crameri* was sometimes cited as *Papilio belia* Cramer [1782] (Rákósy *et al.* 2003) or as *Euchloe belia gigantea* Caradja, 1931 (Popescu-Gorj & Drăghia 1964).

This species prefers open areas (often rather ruderal) and is a fast flyer with considerable dispersion ability, so that it is likely to be more widespread at least in Dobrogea. Although listed as endangered by Rákósy (2003), with the new available data on its distribution and abundance, we consider it vulnerable at national level.

***Lycaena tityrus* (Poda, 1761)**

Material. 1♂, 1♀, Canaraua Fetei (Constanța county), 25–26.ix.2006; > 20 specimens observed, Canaraua Fetei (Constanța county), 30.ix–2.x.2007; 5♂, Esecchio Forest (Constanța county), 29.vi.2008.

Lycaena tityrus is a fairly widespread and common species in Romania, being recorded from all the country's historical regions (Rákósy *et al.* 2003). Nevertheless, the butterfly has been recorded from Dobrogea (northern part)

only by Mann (1866) who cites it as "*Polyommatus Dorilis* Hufn.". Mann mentions he found the species to be relatively common in May and July, without indicating exact localities. *Lycaena tityrus* was later collected by Ostrogovich from Balchik (end of July 1928) (Popescu-Gorj 1964), in the Bulgarian part of Dobrogea. The presence of this species in Dobrogea was considered as requiring reconfirmation (Skolka 1994).

During the autumns of 2006 and 2007, we encountered the species in Canaraua Fetei, the butterfly being particularly abundant at the end of September 2007. These observations, together with the specimens collected at Esechioii forest (Fig. 4), represent the first records for the south of Dobrogea, and the second citation from the entire province after 142 years.

***Tomares nogelii* (Herrich-Schäffer, 1851)**

An extremely local species considered as critically endangered in Romania (Rákossy 2003). According to some authors (Tolman & Lewington 1997, Rákossy & Wieser 2000, Rákossy *et al.* 2003), in Romania it is represented by the subspecies *dobrogensis* Caradja, 1895, while other authors (Van Oorschot & Wagener 2000, Tshikolovets 2003) list it under the nominotypical subspecies. *Tomares nogelii* was recorded for the first time in Romania by Mann (1866) from the surroundings of Tulcea (northern Dobrogea). A few more specimens were found in the same area during the 1970's (Van Oorschot & Wagener 2000). The species was also known to survive near Galați (Gârboavele forest, south-eastern Moldavia), from where it has been collected by several lepidopterists such as F. König (Stănescu 1995) and V. Olaru (Marcu & Rákossy 2002). Nevertheless, since the late 80's, the species has apparently vanished from both Gârboavele forest and the surroundings of Tulcea.

The very local character of *T. nogelii* is mainly related to its larval food plant, *Astragalus ponticus* (Fabaceae). This plant is rare and localized in Romania, being almost exclusively recorded from the south-eastern part of Romania (south-eastern Moldavia, Dobrogea and south-eastern Muntenia) (Oprea 2005).

From 2nd to 7th of June 2008, we undertook field research in an attempt to find *T. nogelii* in south-eastern Romania. We directed our attention to already known or potential areas for *A. ponticus*: Moldavia – surroundings of Zorleni (Vaslui county), Buciumeni forest (Bacău county), Oancea (Prut river banks, Galați county), Gârboavele forest (Galați county); Dobrogea – parts of Măcin mountains and their surroundings, Smârdan (Danube river banks), Babadag forest, and Gura Dobrogei.

We found *A. ponticus* in two already known locations, namely Gârboavele and Babadag forests. The plant was poorly represented in Babadag (3-4 individuals). At Gârboavele forest, the historical site for *T. nogelii*, we counted about 15 plants gathered in 3 small groups (Fig. 5). Although the moment was correct according to the known phenology of *T. nogelii* (end of May - first half of June) and the plants had several buds ready to open, we couldn't observe any adult or larvae.

The causes for the decline of *T. nogelii* in Romania are not clear, but at least the following factors might have played a significant role:

- The Romanian populations lie at the western limit of the species' range in Europe.

- Although representing a Natura 2000 site, large parts of Gârboavele forest look fairly disturbed as consequence of weekend tourism, uncontrolled grazing and lack of proper management. The ecotone habitats near the forest borders are either inexistent (agricultural fields finishing under the trees), or are invaded by ruderal vegetation such as *Urtica* and *Cannabis*. Many parts are also overgrown by *Robinia* trees.

- Overcollecting possibly also played a role by weakening the very local populations. An example is the 80 specimens (62♂ and 18♀) collected by only one lepidopterist (V. Olaru) at Gârboavele forest during three consecutive years (1970–1972) (Marcu & Rákósy 2002).

Another interesting phenomenon is the apparently temporary occurrence of *A. ponticus* in certain areas. In August 2007, we identified numerous healthy plants near Smârdan (Tulcea county), at about 10 m from the Danube's shores. Visiting the same place in the beginning of June 2008, we had the surprise to see that none of these plants survived there, the area being overgrown by very tall weeds. This might be due to the fact that the Danube's shores are often flooded, so that the local vegetation is often represented by opportunistic species with ephemeral existence.

Given the very local character of the plant, it is not impossible that isolated colonies of *T. nogelii* might still survive in the country. More directed studies are necessary in order to clarify the status of both *T. nogelii* and *A. ponticus* in the country.

***Lampides boeticus* (Linnaeus, 1767) & *Leptotes pirithous* (Linnaeus, 1767)**

Material. *Lampides boeticus*. > 10 specimens, Nifon (Tulcea county), 2.viii.2007; 3 specimens, Smârdan (Tulcea county), 3.viii.2007.

Leptotes pirithous. 7♂, 2♀, Canaraua Fetei (Constanța county), 24–27.ix.2006; > 500 specimens observed, Canaraua Fetei (Constanța county), 30.ix–2.x.2007; 2 specimens, Smârdan (Tulcea county), 3.viii.2007; 1♂, Periprava (Danube Delta, Tulcea county), 24.viii.2007; > 10 specimens, Râșova (Constanța county), 3.x.2007.

Both species are considered as migrants in Romania (Rákósy 2003), where they have been cited sporadically and in low numbers, especially from the south of the country (e.g. Mann 1866, Popescu-Gorj et al. 1972, König 1975, Ruști 1993, Skolka 1994, Stănescu 1995, Rákósy & Székely 1996, Székely 2005).

Nifon and Smârdan represent two new localities for *L. boeticus* in northern Dobrogea. Moreover, *L. boeticus* was fairly abundant near Nifon and we observed several other specimens (males and females) besides the ones collected.

Smârdan and Râșova represent two new localities for *L. pirithous* in Dobrogea, while from Canaraua Fetei, we record the species for the second time,

after having previously been mentioned based on one male collected in August 1992 (Rákósy & Székely 1996).

It is unclear if the high numbers of *L. pirithous* observed in Canaraua Fetei at the end of September 2007 (more than 500 specimens) represent a massive autumn migration, or are the offspring of summer migrants.

***Cupido (Everes) argiades* (Pallas, 1771)**

Material. 1♂ (several other specimens observed), Nifon (Tulcea county), 2.viii.2007; 1♂, 1♀, Canaraua Fetei (Constanța county), 7.vi.2008.

In contrast to the high abundance and wide distribution of *C. argiades* in Romania (Rákósy et al. 2003), this species is rare and local in Dobrogea. Mann (1866) is the first who mentioned the species from northern Dobrogea, without providing locality details. The second citation was again from northern Dobrogea (1♂ collected on 19th of May 1917 in Babadag) (Fiebig 1927). Later on, *C. argiades* was recollected in Dobrogea only in 1993, this time from the south of the province (1♂ taken on 12th of May in Canaraua Fetei) (Rákósy & Székely 1996). Three more localities from northern Dobrogea were a few years later added by Rákósy & Wieser (2000), who reported the species as fairly common during July and beginning of August in Greci, Horia and Turcoaia (all in Tulcea county).

Therefore, Nifon represents the fifth known locality for *C. argiades* in northern Dobrogea, while the record from Canaraua Fetei confirms the presence of this species (Fig. 6) in southern Dobrogea, from where it was known only based on the male reported by Rákósy & Székely (1996).

***Brenthis daphne* (Bergsträsser, 1780)**

Material. 1 specimen, Canaraua Fetei (Constanța county), 14.vi.1998; 3 specimens, Canaraua Fetei (Constanța county), 7.vi.2008.

This species is fairly widespread and locally abundant in the western, central and northern parts of Romania (Rákósy et al. 2003). Nevertheless, it seems to be very rare and local in Dobrogea from where it was recorded for the first time by Mann (1866) based on a male collected in the northern part of the province ("Marcosch", July 1865). Later it was reported by Fiebig (1927) from Babadag (in June 1917).

Although collected in 1931 by Ostrogovich from the Bulgarian part of Dobrogea (Balchik) (Popescu-Gorj 1964), *B. daphne* was only again collected in the Romanian part of Dobrogea in 1993 (four specimens taken at the end of June in Canaraua Fetei, southern Dobrogea) (Rákósy & Székely 1996). In May 1994, one male was collected in Babadag forest (Skolka 1994) and between 1995–1999 was found in Greci (Măcin Mts.) and Horia (at both locations rare during June) (Rákósy & Wieser 2000).

Therefore, the four specimens collected by us in Canaraua Fetei represent the second mention of *B. daphne* in southern Dobrogea and confirm the presence of this species near the Bulgarian border.

***Brenthis ino* (Rottemburg, 1775)**

Material. 1 specimen, 3 km E of Slava Rusă (Babadag forest, Tulcea county), 30.vi.2008.

Usually associated to damp meadows, *B. ino* has a fragmented distribution across the country's territory. In Dobrogea the species is particularly rare and it is currently known only from the northern part of the province. The first records from northern Dobrogea belong to Mann (1866) who reported *B. ino* from the surroundings of Ciucurova (Tulcea county). The presence of this species in Dobrogea was confirmed only in 1993, based on a male collected at the end of June in Babadag forest (Tulcea county) (Skolka 1994). The third and latest record of *B. ino* from Dobrogea belongs to Rákosy & Wieser (2000), who reported the butterfly from Horia (Tulcea county) as common during June.

The specimen collected by us at 3 km E of Slava Rusă represents the second record of *B. ino* from Babadag forest and the fourth record in all Dobrogea.

***Brenthis hecate* ([Denis & Schiffermüller], 1775)**

Material. 1 specimen, Cerna (Tulcea county), 15.vi.1986; 2 specimens, 3 km E of Slava Rusă (Babadag forest, Tulcea county), 5.vi.2008 (1 specimen), 30.vi.2008 (1 specimen);

Although it is fairly widespread in Transylvania and Banat, *B. hecate* is generally scarce in the south of the country, especially in Dobrogea. Mann (1866) reported the butterfly as common at Ciucurova and in the surroundings of Tulcea city (Tulcea county). After Mann's records, *B. hecate* was rediscovered in Dobrogea in 1999, based on two specimens collected at the beginning of June at Horia (Rákosy & Wieser 2000).

The three specimens collected by us from Cerna and Slava Rusă (Fig. 7) add two new localities to the previous three known from Dobrogea.

***Euphydryas maturna* (Linnaeus, 1758)**

Material. 1♂, 1♀, Canaraua Fetei (Constanța county), 25.vi.1993; 2♂, Canaraua Fetei (Constanța county), 3.vi.1995.

Although recorded from all Romania's historical regions (Rákosy *et al.* 2003), *E. maturna* is a very localized species which is occasionally abundant in suitable habitats. In Dobrogea the species is known based on three very old records coming from the northern part of the province: Mann (1866) mentioned the species from the forested areas around Telița (end of May) and Ciucurova (beginning of June) (both in Tulcea county), while Fiebig (1927) mentioned it from Babadag (1♂ on 5th of June 1917). In addition to these data, in the Catalogue of the Romanian Lepidoptera (Rákosy *et al.* 2003), *E. maturna* was listed as recorded recently from Dobrogea (after 1980), without further details.

Our records from Canaraua Fetei represent the first record of *E. maturna* from southern Dobrogea and the fourth locality known in the entire province. It is worth mentioning that *E. maturna* is known to be present in the Bulgarian part of Dobrogea, in the area of Suha Reka (Abadjiev & Beshkov 2007). This is a more than 62.000 ha sylvo-stepic and karstic mosaic that is in fact the southern continuation of Canaraua Fetei, formed in the dry valley of Suha river.

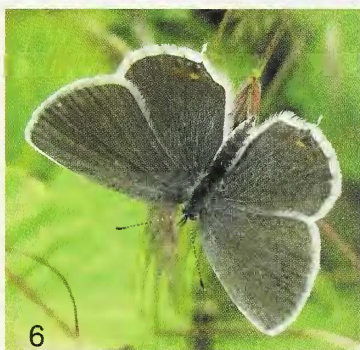


Fig. 3.– The protected area of Canarua Fetei (7.vi.2008), one of the butterfly diversity hotspots in southern Dobrogea, Romania (photo V. Dincă).

Fig. 4.– Male of *Lycaena tityrus*, Romania, Esechioi forest, 29.vi.2008 (photo V. Dincă).

Fig. 5.– *Astragalus ponticus*, Romania, Gârboavele forest, 3.vi.2008 (photo V. Dincă).

Fig. 6.– Female of *Cupido (Everes) argiades*, Romania, Canarua Fetei 7.vi.2008 (photo V. Dincă).

Fig. 7.– *Brenthis hecate*, Romania, 3 Km E from Slava Rusă (Babadag forest), 5.vi.2008 (photo V. Dincă).

Fig. 8.– Habitat of *Hipparchia syriaca* near Greci village (Romania, Măcin Mountains National Park), 1.vii.2008 (photo V. Dincă).

Suha Reka is considered to shelter the largest populations of *E. maturna* in Bulgaria (Abadjiev & Beshkov 2007) and it is rather surprising that the butterfly is so sporadic in the Romanian part (Canaraua Fetei). Mark-recapture studies have shown that, at least in patchy habitat areas, *E. maturna* displays low mobility levels, but displays a certain tendency of dispersing into new patches given proper connectivity (Wahlberg et al. 2002, Cizek & Konvicka 2005). On the other hand, it is worth mentioning that Canaraua Fetei together with Suha Reka represent some of the south-easternmost areas of occurrence for *E. maturna* in Europe (see Kudrna 2002). Further studies are needed in order to assess the status of *E. maturna* in the area of Canaraua Fetei and the population structure and dynamics in the whole area of Suha Reka.

Moreover, as *E. maturna* is protected by law in Romania (see Rákósy 2006) and is considered as vulnerable at national level (Rákósy 2003), detailed information on its distribution and conservation status in the country is urgently needed. In this context, the (probable) population from the protected area of Canaraua Fetei, being one of the southernmost occurring in Romania and in Europe, is of particular interest. We also find worth mentioning a previously unknown population discovered by the authors in the eastern part of Romania (Moldavia), at about 20 km from the border with the Republic of Moldavia. Several adults of *E. maturna* were observed flying in clearings along the forest border on 2nd of June 2008 in an area situated at about 9 km east of Zorleni (Vaslui county) (Fig. 1).

Neptis sappho (Pallas, 1771)

Material. 2♀ (> 10 specimens observed), Canaraua Fetei (Constanța county), 26.ix.2004; 8–10 specimens observed, Canaraua Fetei (Constanța county), 24–27.ix.2006; 8–10 specimens observed, Canaraua Fetei (Constanța county), 30.ix–2.x.2007.

While *N. sappho* is generally well represented in most parts of Romania (Rákósy *et al.* 2003), from Dobrogea it has been recorded only by Mann (1866), who mentioned the butterfly from Telița and Tulcea (both in Tulcea county).

Our findings from Canaraua Fetei confirm the presence of *N. sappho* in Dobrogea and represent the first record of this species from the southern part of the province.

On the other hand, the late dates on which the specimens were observed at Canaraua Fetei are unusual. Some of the adults observed during three different years in Canaraua Fetei at the very end of September were relatively fresh (especially the females), while others were more obviously worn out.

Most authors state that in Europe the second brood of *N. sappho* ends in August (Tolman & Lewington 1997, Pamperis 1997, Lafranchis 2004, Kolev 2008), or in September (Higgins & Riley 1970, Beneš *et al.* 2002, Slamka 2004, Abadjiev 1995). Nevertheless, at least in some parts of Europe such as eastern Austria, adults of *N. sappho* have been observed flying until October, as a consequence of a prolonged second brood (Jutzeler *et al.* 2000). Niculescu (1965), referring to the general phenology of this butterfly, mentioned that its second brood covers the interval July–October. Thus, the most likely hypothesis

is that the specimens we observed at the end of September might belong to a very prolonged second brood. This might happen as a consequence of late ovopositions by females of the first brood, combined with favourable regional climatic conditions.

***Apatura metis* Freyer, 1829**

Material. 6♂, 2♀, 2 km E of Smârdan (Tulcea county), 3.viii.2007.

In Romania, the distribution of *A. metis*, formerly considered a subspecies of *Apatura ilia* ([Denis & Schiffermüller], 1775) (Niculescu 1965), follows mainly the Danube, including the delta. Although in Europe *A. metis* is considered a bivoltine species (Tolman & Lewington 1997, Tshikolovets 2003, Lafranchis 2004, Slamka 2004), its voltinism in Romania is controversial. Niculescu (1965) mentioned that *A. metis* is bivoltine (June, August) across all its Romanian distribution. Rákosy & Székely (1996) considered it as univoltine (June–July) in southern Dobrogea and bivoltine in the Danube Delta and the flooded areas of the Danube. Székely (2006) reported it as occasionally developing a partial second brood (August) in the Danube Delta. Dincă & Vila (2008) recorded the species from Southern Dobrogea (Canaraua Fetei) on the 22nd of May 2007 and suggested that *A. metis* has two broods in southern Dobrogea, similarly to the populations from the north of the province.

Near Smârdan the species seems to develop a vigorous population as, besides the collected specimens, we could observe several others flying in the canopy of the *Salix* flooded forests. With the exception of one female, all the specimens we collected were fresh, indicating that the species was at the peak of the flight period at the beginning of August. These data suggest that *A. metis* is bivoltine in Romania, flying probably between end of May – beginning of July and end of July–August, although partial overlaps between the two broods are not excluded.

***Kirinia roxelana* (Cramer, 1777)**

Material. 1♀ observed, Esecchio forest (Constanța county), 29.vi.2008.

Kirinia roxelana is classically known from the extreme south-west of Romania (a few areas around the Danube and Cerna Mountains) (Rákosy & Neumann 1997, Rákosy & Wieser 2000). In Dobrogea, the species was discovered recently and it is known from only two locations:

(1) The forested area around Horia (Tulcea county), from where Rákosy & Wieser (2000) mentioned two females found the 24th of July 1998.

(2) The Esecchio forest (Constanța county), from where the species was recorded by Dincă (2005) based on several males and females collected in June and July 2001.

The 29th of June 2008 we spent several hours in Esecchio forest trying to find specimens of *K. roxelana* and one female was observed resting on a *Quercus* trunk, at about three meters from the ground.

Although rare and localized, the species is likely to be more widespread in Dobrogea and in several other parts from southern Romania. Several areas of

Dobrogea are very similar to Esecchio forest and therefore may represent suitable habitats for *K. roxelana*. The butterfly may have been overlooked in such places because of its almost exclusive presence within the forest. As few butterfly species can be found in such areas, these were probably not well researched for Rhopalocera.

Kirinia roxelana seems to reach its northern Balkanic distribution limit in the south of Romania, with the northernmost locality at Horia (northern Dobrogea) (Rákossy & Wieser 2000). The records from neighbouring Ukraine were recently considered as requiring confirmation (Tshikolovets 2005).

***Hipparchia syriaca* (Staudinger, 1871)**

Material. 5♂, 10 km S of Babadag locality (Babadag forest, Tulcea county), 30.vi.2008, prep. genit. 677–679/Dincă; 30♂, 8♀ (> 300 observed specimens), Greci–Morsu Valley to Șaua Țuțuiatului (Măcin Mts., Tulcea county), 1.vii.2008, prep. genit. 670–674, 680–683/Dincă.

This species is known in Romania only from southern Banat and northern Dobrogea (Rákossy & Wieser 2000, Rákossy *et al.* 2003). In both regions the butterfly is considered to be data deficient (Rákossy 2003). In Dobrogea, *H. syriaca* is known from the area of Măcin Mountains (Greci and Horia), where it was reported as common in the dry rocky areas of the mountain (Rákossy & Wieser 2000).

The specimens collected by us at Babadag forest represent the third known locality for *H. syriaca* in Dobrogea and the southernmost record of this species in the region. The collecting site from Babadag is located at about 30 km south-east from Horia and at about 50 km south-east from Măcin Mountains (Fig. 2).

On the other hand, we found the species to be extremely abundant in Măcin Mountains, near Greci village, following the path through Morsu Valley until reaching Șaua Țuțuiatului. This area has a pronounced sylvo-stepic character, with sparse *Quercus* trees on a rocky (granite) substratum (Fig. 8). The butterflies manifested an identical behaviour to *Hipparchia fagi* (Scopoli, 1763), as they were often resting on the *Quercus* tree trunks (more rarely on the ground or rocky slopes) and it was common to see several specimens resting on the same tree.

Hipparchia syriaca is difficult to separate from *H. fagi* based on wing characters alone. Nevertheless, it can be easily identified through genitalia examination, especially based on the morphology of the Jullien organ, which has two wide lamellae each bearing 7–8 sclerified flat batons (Fig. 9). By comparison, the Jullien organ of *H. fagi* displays narrower lamellae, each bearing 3–5 slender batons (Fig. 10).

It is interesting that *H. fagi* was also reported from various parts of Dobrogea (e.g. Mann 1866, Skolka 1994), including the Babadag forest (Fiebig 1927, Skolka 1994) and Măcin Mountains (Rákossy & Wieser 2000). The two species might be sympatric in some areas of Dobrogea as this phenomenon was reported for example from parts of the Balkans (e.g. Bulgaria – Abadjiev 1993, Kolev 2008). Yet, the relationship between *H. syriaca* and *H. fagi* in Dobrogea is very

poorly known, as it is not clear how many of the records of *H. fagi* from this province were based on genitalia examination.



Fig. 9.— Jullien organ of male *Hipparchia syriaca*, ca. 10 km S from Babadag locality (Babadag forest, Tulcea county), 30.vi.2008. Prep. genit. no. 678/Dincă.



Fig. 10.— Right lamella of the Jullien organ of male *Hipparchia fagi*, surroundings of Dobraia (Caraș-Severin county), 30.vii.2007. Prep. genit. no. 669/Dincă.

Hipparchia syriaca might be more widespread in the southern parts of Romania, but its external similarity to *H. fagi* might have strongly limited the availability of reliable data concerning its general distribution in Romania. With the current data, it seems that *H. syriaca* reaches its northern Balkanic range limit in the north of Dobrogea (Măcin Mountains) (see also Kudrna 2002).

***Carcharodus orientalis* Reverdin, 1913 & *C. floccifera* (Zeller, 1847)**

Material. *Carcharodus orientalis*. 1♂, 2 km E Smârdan (Tulcea county), 3.viii.2007, prep. genit. 505/Dincă; 6♂, Gârboarele forest (Galați county), 3.vi.2008, prep. genit. 634–636, 648, 649, 654/Dincă; 1♂, Oancea (Galați county), 2.vi.2008, prep. genit. 645/Dincă; 1♂, 3 km NE Slava Rusă (Babadag forest, Tulcea county), 5.vi.2008, prep. genit. 653/Dincă; 5♂, Gura Dobrogei (Constanța county), 6.vi.2008, prep. genit. 650–652, 666, 702/Dincă.

Carcharodus floccifera. 3♂, Canaraua Fetei (Constanța county), 24.ix.2006 (1 specimen, prep. genit. 684/Dincă); 22.v.2007 (1 specimen, prep. genit. 448/Dincă); 7.vi.2008 (1 specimen, prep. genit. 646/Dincă).

Species recently recorded in Romania (Rákossy & Varga 2001) based on material collected in various localities from southern and northern Dobrogea, including the Danube Delta. The distribution of *C. orientalis* is very poorly known as the species is externally very similar to *C. floccifera* and reliable

identification requires genitalia examination. The following are the properly documented records for this species in Romania:

- Southern Dobrogea – Canaraua Fetei, Hagieni (Rákosy & Varga 2001), Dumbrăveni (Dincă & Vila 2008);
- Northern Dobrogea – Turcoaia and Horia (Rákosy & Varga 2001), Tulcea (Rákosy & Varga 2001), Greci (Rákosy & Varga 2001, Dincă & Vila 2008), Babadag (Dincă & Vila 2008);
- Danube Delta – Maliuc, Letea, Caraorman (Rákosy & Varga 2001).

During the last years, the authors collected several specimens of the *Carcharodus floccifera* / *orientalis* group from several localities in Dobrogea and southern Moldavia (Figs. 1, 2). After genitalia examination, the specimens proved to belong to *C. orientalis*. The records from Oancea and Gârboavele forest (both in Galați county, SE Moldavia) represent the first certain records of *C. orientalis* outside Dobrogea (Figs. 1, 11, 12).

Moreover, Oancea lies on the western shore of Prut river, exactly on the border between the Romanian historical region of Moldavia and the Republic of Moldavia. Because the species flies on the western side of the river and identical habitats are present on the eastern side, we consider very likely that *C. orientalis* is also present in the Republic of Moldavia, a country which has barely been studied (Kudrna 2002, Tshikolovets 2003). One new locality is also reported for northern Dobrogea (Smârdan), while Gura Dobrogei represents the first record of *C. orientalis* from the central part of Dobrogea.

On the other hand, it was not clear if both *C. orientalis* and *C. floccifera* are present in Dobrogea, as previous records of the latter (before 2001, when *C. orientalis* was not known from Romania) (e.g. Skolka 1994, Stănescu 1997) might very well refer in reality to *C. orientalis*. The three specimens collected by us in Canaraua Fetei, belong to *C. floccifera* (Fig. 13) and prove the presence of *C. floccifera* in Dobrogea. Moreover, because Rákosy & Varga (2001) mention *C. orientalis* from Canaraua Fetei, this might represent the first known Romanian locality where the species are sympatric. This phenomenon was reported, for example, from Greece, where *C. floccifera* and *C. orientalis* cohabitate between 1700–1800 m (Lafranchis 2003). A rather unusual aspect is that in Canaraua Fetei *C. floccifera* flies at very low altitude (20 m). This species usually flies in Romania in hilly and mountainous areas, preferring stream banks and more or less damp meadows.

According to our observations, the adults of *C. orientalis* usually fly along dust roads in the vicinity of forest or shrub areas (Babadag, Gârboavele, Gura Dobrogei, Canaraua Fetei, Dumbrăveni) but also in the vicinity of rivers where they prefer the areas along temporarily flooded ditches (Oancea, Smârdan).

As already stated by Rákosy & Varga (2001), we consider that *C. orientalis* might be present in several other parts of Romania, especially south of the Carpathians, but also in stepic parts of Transylvania.

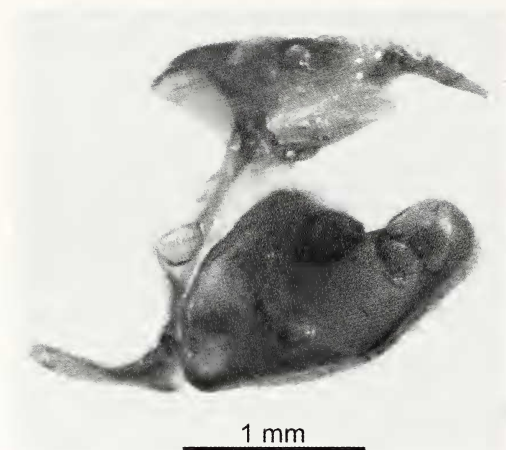


Fig. 11.– Lateral view of male genitalia of *Carcharodus orientalis*, Romania, Oancea, 2.vi.2008. Prep. genit. 645/Dincă.

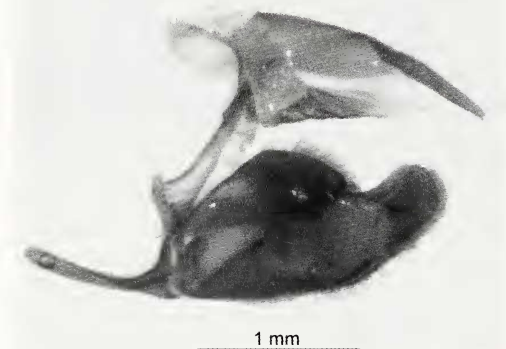


Fig. 12.– Lateral view of male genitalia of *Carcharodus orientalis*, Romania, Gârboavele forest, 3.vi.2008. Prep. genit. 648/Dincă.

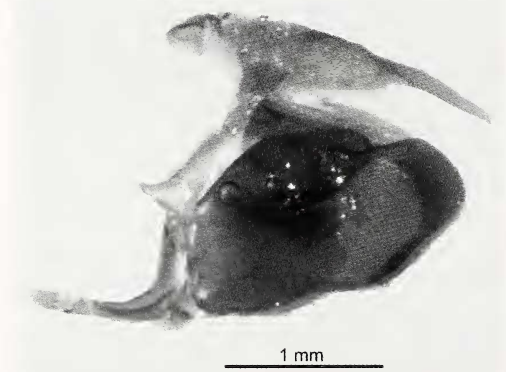


Fig. 13.– Lateral view of male genitalia of *Carcharodus floccifera*, Romania, Canarua Fetei, 7.vi.2008. Prep. genit. 646/Dincă.

Carcharodus orientalis is listed as vulnerable in the Red List of the Romanian Rhopalocera (Rákosy 2003). The butterfly is often an inhabitant of rather ruderal habitats and seems to be capable of surviving in fairly disturbed areas. Its high ecological plasticity was also reported in other studies (see Lafranchis 2003). Given the current data on its distribution and ecology in Dobrogea and southern Moldavia, it seems to have a fairly large potential distribution in Romania. Therefore, we consider it near threatened in Dobrogea and data deficient at national level.

Conclusions

- *Lycaena tityrus* and *Neptis sappho* are rediscovered in Dobrogea after 142 years. Together with *Euphydryas maturna*, these species are also reported for the first time from the southern part of Dobrogea.

- A well established population of *Zerynthia polyxena* is confirmed for Dobrogea based on larvae encountered in the southern part of the province (Canaraua Fetei) for two consecutive years.

- *Euchloe ausonia* is recorded for the first time from northern Dobrogea after 54 years, while we provide the third to fifth record in the entire province for several species (*Cupido (Everes) argiades*, *Brenthis daphne*, *Brenthis ino*, *Brenthis hecate*, and *Hipparchia syriaca*).

- Based on published and original data, it is concluded that *Apatura metis* is likely to develop two broods in Dobrogea.

- *Lampides boeticus* and *Leptotes pirithous*, which are rare migrants in Romania, are reported from several localities in Dobrogea. The latter was found to be particularly abundant in southern Dobrogea (Canaraua Fetei) during the autumn of 2007.

- The knowledge on the distribution of *Carcharodus orientalis* in Romania is improved with new localities from Dobrogea and its range extended to neighbouring Moldavia.

- The capture of several specimens of *Carcharodus floccifera* in Canaraua Fetei (southern Dobrogea) determined by genitalia confirms the presence of this species in the province. Since *C. orientalis* has also been reported in this locality, it is possible that both species occur sympatrically in Canaraua Fetei.

- The value of some protected areas from Dobrogea (Măcin Mountains, Babadag forest, Gura Dobrogei, Canaraua Fetei, Esecchio forest, etc.) is highlighted and increased by the discovery of rare and local species at regional and national level.

- The survival of *Tomares nogelii* in Romania is considered to require confirmation due to the lack of recent records and the apparent absence of the species from its main site, namely Gârboavele Forest.

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References

- Abadjiev, S. 1993. *Butterflies of Bulgaria*. Part 2. Nymphalidae: Libytheinae & Satyrinae. — Verena Publishers, Sofia, 89 p.
- Abadjiev, S. 1995. *Butterflies of Bulgaria*. Part 3. Nymphalidae: Apaturinae & Nymphalinae. — Stanislav Abadjiev, Sofia, 159 p.
- Abadjiev, S. & Beshkov, S. 2007. *Prime Butterfly Areas in Bulgaria*. — Pensoft, Sofia, 222 p.
- Bálint, Zs. & Székely, L. 1995. Tavaszi lepidopterológiai megfigyelések Dobruzdzásban. — *Folia entomologica Hungarica* **56**: 228–230.
- Beneš, J., Konvička, M., Dvořák, J., Fric, Z., Havelda, Z., Pavliče, A., Vrabec, V. & Weidenhoffer, Z. (eds.) 2002. *Motýli České republiky: Rozšíření a ochrana I, II / Butterflies of the Czech Republic: Distribution and conservation I, II*. — SOM, Praha, 857 p.
- Cizek, O. & Konvička, M. 2005. What is a patch in a dynamic metapopulation? Mobility of an endangered woodland butterfly, *Euphydryas maturna*. — *Ecography* **28**: 791–800.
- Dincă, V. 2005. New data regarding several Lepidoptera species little known in Romania. — *Studia Universitatis Babeş-Bolyai, Biologia* **50**(1): 11–16.
- Dincă, V. & Vila, R. 2008. Improving the knowledge on Romanian Rhopalocera, including the rediscovery of *Polyommatus amandus* (Schneider, 1792) (Lycenidae) and an application of DNA-based identification. — *Nota Lepidopterologica* **31**(1): 3–23.
- Fiebig, W. 1927. Beitrag zur Schmetterlings fauna Rumäniens. — *Deutsche Entomologische Zeitschrift*: 101–109.
- Higgins, L. G. & Riley, N. D. 1970. *A Field Guide to the Butterflies of England and Europe*. — Collins, London, 380 p.
- Jutzeler, D., Höttinger, H., Malicky, M., Rebeušek, F., Sala, G. & Verovnik, R. 2000. Biology of *Neptis sappho* (Pallas, 1771) based on the monograph by Timpe & Timpe (1993) and its actual distribution and conservation status in Austria, Italy and Slovenia (Lepidoptera: Nymphalidae). — *Linneana Belgica* **17**(8): 315–332.
- Kolev, Z. 2008. *The butterflies of Bulgaria*. — <http://www.butterfliesofbulgaria.com>
- König, F. 1975. *Catalogul colecției de lepidoptere a Muzeului Banatului*. — Muz. Banatului, Timișoara, 284 p., 20 pls.
- Kudrna, O. 2002. The distribution atlas of European butterflies. — *Oedippus* **20**: 1–342.
- Lafranchis, T. 2003. Biologie, écologie et répartition de *Carcharodus orientalis* (Reverdin, 1913) en Grèce. Comparaison avec *Carcharodus flocciferus* (Zeller, 1847) (Lepidoptera, Hesperidae). — *Linneana Belgica* **19**(3): 140–146.
- Lafranchis, T. 2004. *Butterflies of Europe*. — Diatheo, Paris, 351 p.
- Mann, J. 1866. Aufzählung der im Jahre 1865 in der Dobrudscha gesammelten Schmetterlinge. — *Verhandlungen der k. k. zoologisch-botanischen Gesellschaft Wien* **16**: 1–40.
- Marcu, A. & Rákossy, L. 2002. *Catalogul colecției de lepidoptere "Dr. Vladimir Olaru" din Complexul Muzeal de Științele Naturii Galați*. — Soc. lepid. rom., Cluj-Napoca, 172 p.
- Niculescu, E. V. 1963. *Fam. Pieridae* (Lepidoptera). — Ed. Academiei R.P.R., București. Fauna R.P.R. **11** (6), 202 p., 13 pls.
- Niculescu, E. V. 1965. *Fam. Nymphalidae* (Insecta). — Ed. Academiei R.P.R., București. Fauna R.P.R. **11** (7), 362 p., 20 pls.
- Oprea, A. 2005. *Lista critică a plantelor vasculare din România*. — Ed. Universității "Alexandru Ioan Cuza" Iași, 668 p.
- Pamperis, L. N. 1997. *The Butterflies of Greece*. — Bastas-Plessas, Athens, 574 p.
- Popescu-Gorj, A. 1959. Date noi asupra Lepidopterelor din Dobrogea. — *Acad. RPR., Stud. cercet. biol. ser. biol. anim., București* **11**(1): 7–25.

- Popescu-Gorj, A. 1964. *Catalogue de la collection de lépidoptères "Prof. A. Ostrogovich" du Muséum d'Histoire Naturelle "Grigore Antipa", Bucarest.* — Ed. Mus. "Grigore Antipa", Bucarest, 320 p., 16 pls.
- Popescu-Gorj, A. & Drăghia, I. 1964. New studies on the Lepidoptera of Northern and Southern Dobroudja. — *Acad. R.P.R. Rev. Roum. de Biol. sér. Zool., Bucarest* 9(1): 27–38.
- Popescu-Gorj, A. & Drăghia, I. 1967. Ord. Lepidoptera. — In: Scobiola-Palade, X. & Popescu-Gorj, A. L'Entomofaune des forêts du sud de Dobroudja. — *Travaux du Musée d'Histoire naturelle "Grigore Antipa", Bucarest* 7: 181–212, 6 pls.
- Popescu-Gorj, A., Olaru, V. & Drăghia, I. 1972. Ord. Lepidoptera. — In: L'Entomofaune du Grind Caraiman (Delta du Danube). — *Travaux du Musée d'Histoire naturelle "Grigore Antipa", Bucarest* 12: 181–206.
- Rákossy, L. 2003. Lista roșie pentru fluturii diurni din România. — *Bul. inf. Soc. lepid. rom.* 13(1–4): 9–26.
- Rákossy, L. 2006. U.E și legislația pentru protecția lepidopterelor din România. — *Bul. inf. Soc. lepid. rom.* 16 (2005): 89–96.
- Rákossy, L. & Neumann, H. 1997. Macrolepidopterele din Valea Cernei. — In: Rákossy, L. (ed.). *Entomofauna parcurilor naționale Retezat și Valea Cernei.* — Societatea Lepidopterologică Română, Cluj-Napoca. Chapter pagination: 123–151.
- Rákossy, L. & Székely, L. 1996. Macrolepidopterele din sudul Dobrogei. — *Entomologica Romanica* 1: 17–62.
- Rákossy, L. & Varga, Z. 2001. *Carcharodus orientalis* Reverdin, 1913 und *Melitaea punica telona* Fruhstorfer, 1908 (Lepidoptera: Hesperidae, Nymphalidae) in der Fauna Rumäniens. — *Entomologica Romanica* 5 (2000): 45–49.
- Rákossy, L. & Wieser, C. 2000. Das Macin Gebirge (Rumänien, Nord-Dobruška). Ein durch hohe Biodiversität gekennzeichnetes Refugium relikitärer Arten. Fauna und Flora, unter besonder Berücksichtigung der Schmetterlinge und der Vegetationsverhältnisse. — *Carinthia* II, Klagenfurt. 190/110: 7–116.
- Rákossy, L., Goia, M. & Kovács, Z. 2003. *Catalogul Lepidopterelor României / Verzeichnis der Schmetterlinge Rumäniens.* — Societatea Lepidopterologică Română, Cluj-Napoca, 446 p.
- Ruști, D. 1993. Noutăți faunistice din Dobrogea (Insecta: Lepidoptera). — *Bul. inf. Soc. lepid. Rom., Cluj-Napoca* 4(1): 17–18.
- Skolka, M. 1994. Date referitoare la lepidopterele din Dobrogea (Grypocera, Rhopalocera). — *Bul. inf. Soc. lepid. rom.* 5(3–4): 223–243.
- Slamka, F. 2004. *Die Tagfalter Mitteleuropas. Ostlicher Teil.* — František Slamka, 288 p.
- Stănescu, M. 1995. The catalogue of "Ludovic Bereszgászy" lepidopteran collection (Insecta: Lepidoptera). — *Travaux du Musée d'Histoire naturelle "Grigore Antipa", Bucarest* 35: 221–346.
- Stănescu, M. 1997. New data concerning the Lepidoptera fauna of southern Dobrogea (Romania). — *Travaux du Musée d'Histoire naturelle "Grigore Antipa", Bucarest* 39: 91–107.
- Székely, L. 2005. Noutăți lepidopterologice din sud-estul Transilvaniei (județul Brașov, România). — *Bul. inf. Entomol.* 14–15 (2003–2004): 41–56.
- Székely, L. 2006. *Lepidopterele (Fluturii) din Delta Dunării.* — Disz-Tipó, Săcele, 151 p.
- Tolman, T. & Lewington, R. 1997. *Field Guide of the Butterflies of Britain and Europe.* — Collins, London, 320 p., 104 pls.
- Tshikolovets, V. V. 2003. *Butterflies of Eastern Europe, Urals and Caucasus.* — Kyiv-Brno, 176 p., 47 pls.
- Tshikolovets, V. V. 2005. The Butterflies of Ukraine. — *Zbirnik Prats Zoologichnogo Muzeiyu, Kyiv* 37: 13–62.
- Van Oorschot, H. & Wagener, S. 2000. Zu *Tomares* in der Türkei. Ergänzungen und Korrekturen zu Hesselbarth, van Oorschot & Wagener, 1995: Die Tagfalter der Türkei. 3 (Lepidoptera). — *Phegea* 28(3): 87–117.
- Wahlberg, N., Klemetti, T., Selonen, V. & Hanski, I. 2002. Metapopulation structure and movements in five species of checkerspot butterflies. — *Oecologia* 130: 33–43.